

Examining scope of improvement in performance of FMCG Supply Chain using Block Chain Technology

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ABSTRACT

The significance of managing supply chains efficiently and the value it creates for businesses cannot be overstated. Firms have been competing on their supply chains for decades now and this competition has become fierce in modern times. This paper aims to study the insufficiency of transparency, traceability, scalability and security in FMCG Supply chain based on information from people working in IT, Manufacturing and FMCG industries. It examines the application of Blockchain Technology as an enabler to enhance performance of FMCG Supply Chains. It also assesses the effects of adoption of Blockchain technology to solve transparency, traceability, scalability and security issues. This study also aims to generate insights on concerns regarding the blockchain technology that, since the technology is still in its initial phase. The research was exploratory in nature and conducted through the use of qualitative research methods.

In a world driven by information, customers are being more and more aware of the internal aspects of a firm such as how the quality is maintained, how good are the suppliers etc., By adopting Blockchain technology we can improve the Supplier trust as it increases accountability of the suppliers through distributed ledger system. It also installs a tamper proof supply chain system during distribution. This reduces the counterfeit and fake goods in the system. These inherent traits of Blockchain can be used to improve Customer Trust over the brand and the firm, thereby helping it to in gaining competitive advantage in the market.

Originality:

This paper is critically designed to research on challenges faced by FMCG supply chains. The earlier researches are limited to the whole supply chain in general or a particular nucleus firm.

Keywords:

Blockchain, FMCG, Supply Chain, Transparency, Security, Scalability, Performance

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1. Introduction

The aim of this section is to acquaint the reader with the context of the study, the research purpose, gaps and research questions. There is a short prologue to the objective, but also challenges faced by FMCG supply chains, with it follows the explanations of blockchain technologies in brief. The research problem states more about the concerns which affect the performance of supply chains. The research concentrates on identifying ways blockchain can help solve these issues.

1.1 Background

Industry 4.0 promises an industrial revolution which aims to assimilate manufacturing techniques with disrupting technologies like Blockchain, AI, Computer Vision, Cloud computing, and IOT (Internet of Things) and they're collectively transforming the way various industries operate. Blockchain/Distributed ledger has been seen as a pivotal archetype for long time now which has witnessed a coming together of

technologies which could potentially can transform business operations (Kim and Laskowski 2018).

Bitcoin term was coined by Satoshi Nakamoto, who by this day remains a mysterious figure, when he published the 'Whitepaper Bitcoin: A Peer-to-Peer Electronic Cash System' (Satoshi Nakamoto, 2008). It has been evolving ever since its inception and showing strong potential to impact industries ranging from finance to manufacturing to Agriculture and many others.

Blockchain technology stores data on a decentralized database, which facilitates establishing peer-to-peer connections between different stakeholders. Blockchain, the technology that runs Bitcoin, provides security to every party involved in the transaction (Yli-Huumo et al., 2016).

Increased transparency and traceability ensure certainty in the transaction process between the parties involved. All these potential benefits warrant to examine the scope of performance improvement by using blockchain in the FMCG

industry. This paper also discusses the possible roadblocks in embracing the blockchain technology in the industry through research methodology.

The need for supply chain transparency and the growth of Blockchain are majorly combined together to bring about operational excellence in manufacturing industry (Vinay Reddy, 2019). Traceability in manufacturing supply chains is sophisticated and an unexplored area. Blockchain provides security as well, as a digital vault to guard and secure value and registry of property for various industries with little or no cost that's generally related to the current long, time-consuming process of IP registration (Felin & Lakhani, 2018). If the FMCG Supply Chain implements a blockchain for patent with the principles that are clearly defined and mentioned during a smart contract to be executed by the blockchain, it has the potential to reform the complete patent IP registration process with increased speed, better process efficiency and enhanced transparency (Tsang et al., 2019). Cost of intermediaries such as agencies, legal fees etc. can be eliminated or optimized. Not only this, owing to the architecture of the blockchain traceability & visibility of any new additions or updates could be done. (Wang et al., 2006)

Although a few start-ups have started developing blockchain products, offering them to larger MNCs, deployment outside banking industry is still non-existent. A lot of potential use cases in non-banking sectors of blockchain are being developed to work in the area of supply chain, and food/agriculture. These industrial use cases are expected to provide great ROI at even in the beginning phase of blockchain implementation (Bünger, 2017). Among the various processes that are expected to be digitally transformed using a Blockchain, Supply Chain is a critical one and hence deserves to be examined. The issues and difficulties that occur in traceability in FMCG Supply chain are mostly addressed by adaptation of Blockchain. (Galvez et al., 2018)

One of the the direct benefits of Blockchain is that it provides a possible solution to management which will help them reduce the counterfeit products in the supply chain. (Alam, 2016)

1.2 Research Purpose

1. Study on factors affecting performance of FMCG supply chains.

2. How these issues can be solved leveraging the Blockchain technology?
3. Study on overall improvement in overall ease of doing business in FMCG supply chains.

2. A Brief Overview of Blockchain Technology:

Blockchain technology came into the mainstream with the immense popularity of the Bitcoin. Cryptocurrency has been one of the most buzzing and revolutionary technologies in the last ten years. It is a virtual currency which uses cryptography and facilitates security by verifying all the transactions. It also allows control over creation of new units of a particular cryptocurrency. Blockchain uses cryptography & consensus as principles to enable trust (Lewis, 2015). Blockchain is an open source, shared, distributed ledger used for the collection of information about transactions eliminating a need for a centralised authority. Blockchain utilises a proof of work consensus. Blockchain is an open source, shared, distributed ledger used for the collection of information about transactions eliminating a need for a centralised authority. (Apte & Petrovsky, 2016) Blockchain utilises a proof of work consensus mechanism. Blockchain is an immutable ledger. During a transaction when a block is created, the data present in the block cannot be changed. There is no reliance therefore on centralised databases or any intermediaries. This makes integrity an intrinsic feature Blockchain technology. Transparency in the Blockchain network provides security to the infrastructure as each block is verified by other stakeholders in the system. Trust gets distributed among all the blocks rather than depending on single party, i.e. a centralised database. (Sheel, 2019)

The FMCG sector is characterised by a diverse logistics network and high rivalry that requires businesses to continuously focus on innovations in the supply chain. Companies with a robust supply chain structure succeed while the inefficient supply chains find it very difficult to succeed in a highly competitive market (Chopra & Meindl, 2007). Entire logistics, manufacturing, packing, warehousing operations get affected if the supply chain performance is not optimal. In an FMCG supply chain, multiple layers of retailers have to be managed to ensure goods are in stock at the remotest location. Involvement of multiple

intermediaries in this process makes it extreme tough to track and trace the goods. This brings uncertainty in transparency and security issues. It is leading to many frauds and counterfeiting (Zeliha Eser et al,2014). The adoption of Blockchain technology could enable transparency and security into the Supply Chain.

3 Literature Review

3.1 Block-Chain

Blockchain is a distributed database which stores information of all the transactions amongst different entities. Users of the blockchain can see the latest update in the encrypted ledger and validate the new transaction. Fundamentally, it is a distributed ledger which handles an ever-growing network of blocks and provides a secure platform to execute transactions. (Singh et al, 2016). Every single block created in the network contains a hash, previous hash and data. Hash is a distinct digital signature of a transaction. One of the many benefits of blockchain is that the transactions are created, approved, cleared and

saved in the blocks as and when they are executed (Tapscott & Tapscott, 2017). It’s almost real time. They are being continuously updated in the system, and provide real time visibility to all members (McConaghy et al., 2017). It is enormously hard to modify or hack a Blockchain. In order to attempt a successful fraud or corrupt a block, changes will have to made in majority of the entire network (White, 2017).

Blockchain has the advantage of keeping secure, confidential and tamper-proof records. It stores the records of all the transactions executed in hash form. The blockchain is characterised by self-updating records securely with a timestamp thereby removing central controlling authority and therefore providing built-in trust. (Francisco & Swanson, 2018)

Restricted technology developments, lack of skilled staff, lack of legal frameworks, proper compliances and standards, difficulties with computation, capacities and scalability are current problems that might be the reason of roadblocks to blockchain technology adoption.

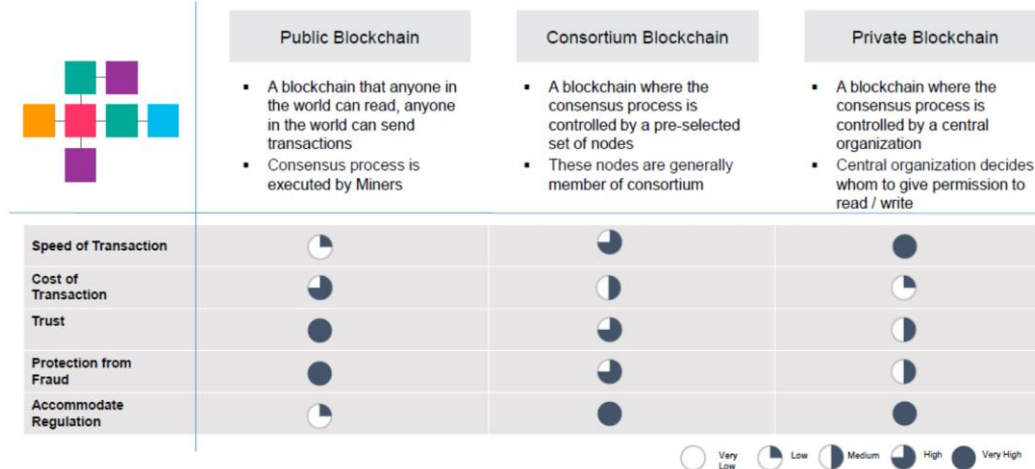


Fig 1. Types of Blockchain

3.2 FMCG Supply Chain

A vital area for success in Fast Moving Consumer Products (FMCGs) sector is efficient supply chain management. Managing SCM is for FMCGs is an extremely complex and challenging task (Perdikakis et al, 2015). Supply chain requires particular consideration among several operations which are likely to be transformed by blockchain. One of the developments that would impact supply chain management is growing dependency on the use of Internet-of - things (IoT) applications. Using IoT, RFID tags, sensors, barcodes, GPS tags and chips, Item location,

packaging, and shipping containers can be tracked. This facilitates better, real-time monitoring of items from their source till it reaches the end customer. Measuring the efficiency of the supply chain management is also defined in terms of objectives such as consistency, speed, reliability, cost and agility (Kshetri et al, 2018). Apart from these KPIs, it is also extremely important to study the importance of efficient supply chain management in establishing and protecting the firms brand value.

Counterfeit products in the market and a shortage of traceability solutions are the major main problems being faced by FMCG Supply

Chains.(Aramyan et al., 2007) The FMCG industry is losing about 30 percent of its sales due to counterfeit goods, according to business estimates. For instance, P&G identified that multiple counterfeit products of their product Vicks Vaporub amount to an equivalent of 54 percent of the original are present in the market. Another popular instance is the Philips-Hue-attack (Ronen et al, 2016), where remote-controlled light bulbs could be hacked, and instantaneously turned on for a entire location, resulting in blackout because of the abrupt energy consumption. This attack is based on Zigbee-protocol, a feature that allows for over-the-air communications between network nodes. After an attacker has hacked even a single node, he will be capable of manipulating the entire network. With the swift increase in dependency on IIoT (Industrial IoT) in the FMCG supply chain, security breach is a big issue (Skwarek et al, 2017).

3.2.1 Issues with Transparency & traceability

Traceability is one major requirement for an FMCG company. Businesses of many FMCG products are often troubled by duplicate products which resemble the original products. These duplicate products which are often made of cheaper quality incur more harm than good for consumers and consumers hence lose confidence in the product. Most often FMCG products expire quickly than any other products, it becomes responsibility of original manufacturer to trace its products in the market and call back all expired products(Galvez et al., 2018). Companies also might face situation where they have to trace back the supplier of the raw materials(Francisco & Swanson, 2018). If there is any issue in any of the product, root cause of the problem can only be identified by tracing the product back to all stages namely transportation, packing, quality inspection, production and source of raw materials, with the help of traceability all other products which might have same issue can be called back before it reaches final customer or consumer (Reyna et al., 2018).

3.2.2 Issues with Scalability

Scalability of Supply Chain using Blockchain technology comes with storage requirement and synchronization speed limitations. A Consensus protocol for transaction validation balancing computational power required can improve the

scalability of the supply chain network using Blockchain (Hyvarinen et al. 2017). This protocol should be fault-tolerant, storage efficient and faster. A database with high throughput and low latency should be combined with P2P distributed file system for a safer, unchangeable and decentralized supply chain network. (Reyna et al,2018)

3.2.3 Issues with Ease of doing business

Blockchain not only has some very specific use cases but also it has the potential to improve the overall business practices. FMCG supply chain even in this age of IT revolution, functions majorly on paperwork (especially in logistics)(Tijan et al., 2019). These practices bring in inefficiencies and data security issues as well. Blockchain with the help of IIOT technologies possess the capability to automate & optimize processes and improve overall ease of doing business.(Issaoui et al., 2019)

3.2.4 Issues with Security

Data authentication in centralised information sharing systems is only done through the central server and thereby it becomes prone to security breaches, privacy issues and compromised systems. Cyberattacks lead to reduced reliability in the system. To check security concerns like spoofing, false authentication, Distributed Ledger-based technology like Blockchain could be used (Kumar & Mallick, 2018). Most of the parties today exchange information through EDI systems, which is a centralised transaction storage system.(Narayanan et al., 2009) While EDI has its own data integrity checks and authentications, It doesn't provide immutability, data entered subsequently can be changed and hence can lead to erroneous data in the system. Blockchain can prevent because the data once accepted and stored is immutable. Blockchain is not a substitute of EDI systems, but it can be used to enhance the overall performance of the system by increasing efficiency and security in the supply chain.

3.2.5 Factors & key parameters

Factors and key areas where Blockchain could be most impactful and help improve the performance of an FMCG supply chain. One of the many promises the Blockchain technology has shown is that it doesn't have a single point of failure. Using tokens to represent physical assets, can provide a

record of ownership of a good and all associated rights. This can be used as goods move between parties in the supply chain and for general trade (Westerkamp et al., 2020). Digital data flow, Anti-money laundering, Invoice automation, Letter of credit, identity verification are some other promising areas for blockchain based improvement in FMCG supply chains. Blockchain based solutions can boost supplier management as it can capture, store and verify information about them. Product recall in FMCG industry is a cumbersome and extremely complex process,

since most of the products would be somewhere in transit, and if the recall not done efficiently it can severely hit the firm’s brand value and could potentially lead to huge losses. A blockchain solution could allow firms to identify products that have issues or defects and trace it efficiently. These identified factors would form the core of the study, through which this paper aims to provide insights about the key drivers of FMCG supply chain performance.(Galvez et al., 2018)

Transparency & traceability (Reyna et al., 2018)	Scalability (Bala & Kumar, 2011)	Ease of doing business	Security (Min et al., 2005)
Anti-Counterfeiting	Faster Processing	Real time Data sharing (Nakasumi, 2017)	Immutable Data
Asset Tracking	Data & Analytics	Improved trade practices White (2017)	Identity verification
Accountability using smart contracts (Swan, 2015)	Efficient storage and tracking	Improved Procurement Process (Kshetri, 2018)	Supplier Management (Tapscott & Tapscott, 2017)
Tackling Bull whip effect (Casey & Wong, 2017)	Building Supply chain resilience (Tapscott & Tapscott, 2017)	Reduced paper work	Secured transfer of ownership Glover and Hermans (2017)
Automated Supplier payment	Competitive advantage (Croom et al., 2007)	Automated Compliance management (Glover & Hermans, 2017)	Checking Unethical practices (Kshetri, 2018)

Table 1 showing identified factors and key parameters

4. Methodology

4.1 Target Population

The target population for the study are professionals from all stages of FMCG Supply Chain. They may be using Blockchain Technology, then the insights give us the advantages and shortcomings of the adaptation. They might not have adopted or might be thinking of adopting blockchain, they give us insights of huddles faced while trying to adopt blockchain.

4.2 Sampling Method

The population sample chosen are professionals from FMCG industry with varied experience levels and across different functions. They also include professionals from Suppliers and distribution team supporting the FMCG industry. So, this includes collection of views from different stages of FMCG Supply Chain. The

different functions are Marketing, Finance, Procurement, Operations, Sales and Distribution.

4.3 Data Collection Instruments and Methods

Semi- Structured interviews are taken online or telephonic. The questions asked are both qualitative and quantitative in nature. The interview is driven by the interviewee’s responses (Tracy, 2010). Focus is on extracting the information about the practicality and feasibility of application of Blockchain in addressing the above-mentioned issues. This is done by studying the huddles obstructing adoption of blockchain and the methods to be followed to extract the maximum advantage of using Blockchain Technology.

4.4 Data Analysis

Exploratory methods through qualitative research is followed in the study. This gives us insights

about the practicality and technicalities of the adoption of blockchain in FMCG. The qualitative research consists of semi structured interviews with industry professionals of FMCG industry (Tracy, 2010). The sample size consists of professionals from different experience and across functions.

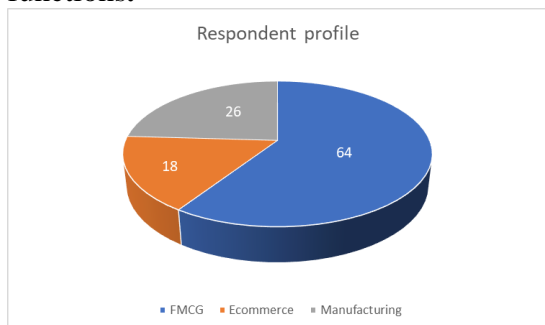


Figure 2. Respondent Profile

Ratings for each of the key factors identified in the literature review were taken from 108 Respondents by conducting surveys. Tableau and MS excel are used to perform Data analysis and to create visualisations based on the analysis. Figure 2 shows that out of 108 respondents, 64 are from the FMCG sector, 18 from Ecommerce and 26 from manufacturing. Professionals had work experience ranging from 2 to 26 years and They work in different departments, with majority of them from the Supply chain and Operations department. 12 respondents were Consultants who have been involved in Digital transformation projects in supply chain domain.

4.5 Findings

The average ratings obtained on various key areas from under the identified factors are shown below in visual graphs

4.5.1 Transparency and traceability

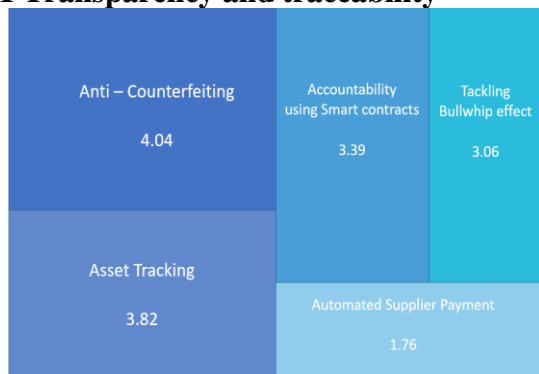
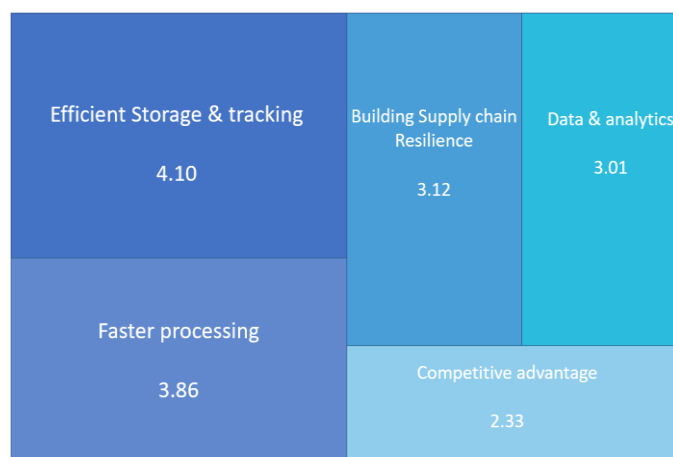


Figure 3. Transparency and traceability – Ratings

Figure 3 shows the ratings received by factors where Blockchain is going to be the most useful and impactful. Anti-Counterfeiting received the highest average rating, which means blockchain could be very impactful in the FMCG supply chain in checking counterfeits of goods. Asset tracking and accountability have received similar average ratings; hence they can be considered of equal importance. Automated supplier payment received lowest average ratings which signifies, professionals believe blockchain is less likely to facilitate automated payment in near future, which is understandable since cryptocurrency is not the standard mode of payment yet.

4.5.2 Scalability

Under Scalability, figure 4 shows the ratings received by factors where Blockchain is going to be the most useful and impactful. Factors like Efficient storage and faster processing received the highest average rating, which means blockchain could be very useful in storing and fetching data and hence improving efficiency in FMCG supply chain. Supply chain resilience and use of data analytics received similar average ratings; hence they can be considered of equal importance. In the short term many professionals don't think blockchain would be used to gain competitive advantage.



4.5.3 Ease of doing business

Under ease of doing business, figure 5 shows the ratings depicting factors where Blockchain could be the most impactful. Real time data sharing received the highest average rating, which simply shows importance of scalable real time data sharing system has in the supply chain. Improved Procurement practices, reduced paperwork and overall improved trade practices are the factors which received similar average ratings; hence they can be considered of equal importance. Automated compliance management received lowest rating.

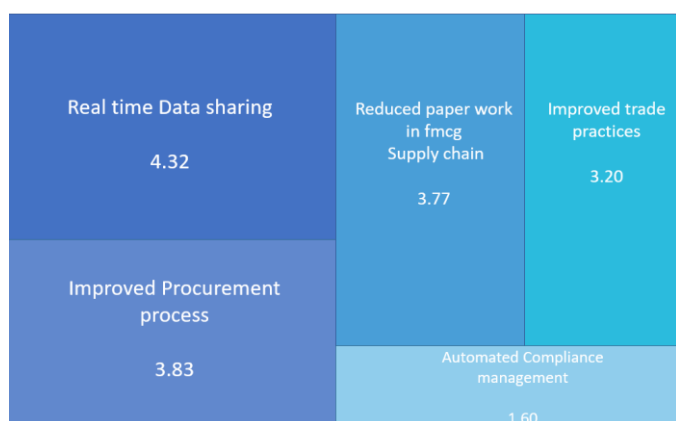


Figure 5. Ease of doing business - Ratings of factors

4.5.4 Security

Under Security, figure 6 shows the ratings received by factors where Blockchain could be most influential. Secured Transfer of Ownership received the highest average rating. Supplier management and Immutable data (which means use cases where complete and incorruptible data is required) have received similar average ratings, hence they can be considered of equal importance. In Long term, professionals believe Blockchain is going to be useful for sustainable and ethical business practices, for instance checking items exported from African countries where chile labour is a malpractice.

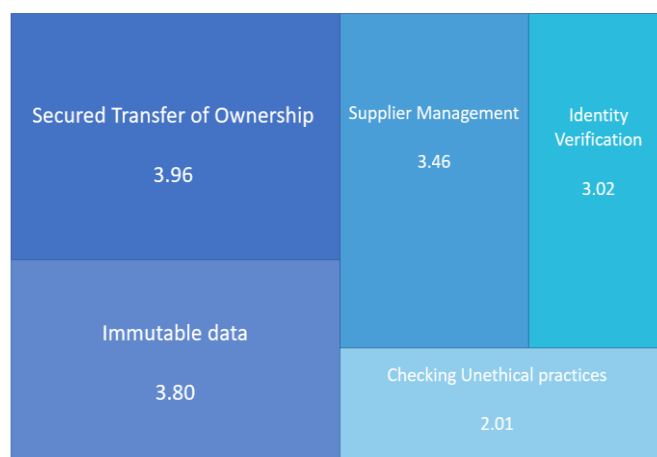


Figure 6. Security- Ratings of factors

5. Conclusions & Limitations

Companies feel a decentralised platform is at lower risks of fraud than centralised systems, since there is an authentication mechanism in place without the need for a middle entity. They believe implementing blockchain in FMCG supply chain could significantly reduce counterfeiting of products with the use of digital IDs and hence build consumer and supplier trust. Professionals agree that blockchain has the potential to help improve accountability and collaboration amongst various partners in logistics by the use of Smart contracts, since most of the end items in FMCG sector is present in transit, especially when trends like last mile delivery are becoming mainstream. During situations like Product recall there is a fire fighting scenario, companies believe blockchain may make the process efficient but they're unsure whether this would result in reduced costs. Some professionals who had knowledge about EDI based information sharing believe blockchain based information sharing is better and create great value if it is used to complement EDI systems, while others were not sure of the comparison due to lack of subject matter knowledge. Companies also believe blockchain based collaboration can help build trust & improve supplier relationships through its high level of transparency and data security. Blockchain may provide competitive advantage in industries with high competition, since there is very high level of trust amongst partners in the supply chain network.

Finally, companies admit transparency in information sharing could influence consumer buying behavior, especially in foods & beverages sector, since today's consumer is much more

aware and concerned about what it consumes as well as about the impact of the products on the environment.

Blockchain solutions differ for different industries and have different applications. The objective of this study was to understand the benefits & concerns specifically for FMCG supply chain. It presents more potential opportunities such as speed, reduced cost, better efficiency, involvement of customers, and awareness. At a higher level, the role of transparency, security and traceability were identified as enablers of information sharing among various stakeholders using the blockchain. The empirical findings exhibited the benefits of using blockchain technology as it offers a secure way of sharing and storing data. It provides more control as the data becomes Immutable and hence enhances traceability. However, no technology is full-proof, there still are concerns over implementation and scalability of the blockchain technology.

After extensive secondary research of existing literature, research gap was identified and questionnaire for the interview was also based on the secondary research. The empirical data was collected mainly through online surveys and telephonic interviews. Secondary sources like company documents/publications, reports were also used in collecting information,

Major limitation is that blockchain technology is in infancy period where companies have just begun to launch pilot projects. Hence, even they don't have much experience how influential their blockchain solutions can be on business. Also, those companies who are running those pilot projects are hesitant in sharing the results in order to get the competitive advantage over others.

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